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Anion exchange chromatography in lignocellulosics analysis

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Complex liquid samples such as lignocellulose hydrolyzates which contain both polar and nonpolar analytes as well as monomeric and oligomeric compounds are hard to analyze and require usually more than one analytical separation mechanism. In contrast, the reversed-phase mechanism anion exchange chromatography (AEC) allows for a separation of divergent analytes based on the acidity of the resulting anion. Thus, the aim of this study was to investigate the potential of AEC to analyze lignocellulosic biomass hydrolyzates completely using one analytical separation mechanism, as lignocellulose hydrolyzates contain a lot of potential anions with a variation in polarity and size. Therefore, the potential of generating anions from aldehydes, alcohols and phenols was investigated using an alkaline eluent. Additionally, the concentrations of aldehydes, alcohols and phenols derived from lignins were measured simultaneously with monosaccharides, oligosaccharides and uronic acids derived from cellulose, hemicellulose and pectin. Thus, parameters such as column temperature, eluent composition and chromatographic run time were examined. The final chromatographic method was set to a column temperature of 40°C, an eluent flow of 1 ml/min and an eluent consisting of sodium acetate and sodium hydroxide as well as ultrapure water. This method allows for a complete characterization of lignocellulose hydrolyzates with limit of detections in the range of 0.014 mg/L for 2,6-dimethoxyphenol and 21.9 mg/L for 4-methoxybenzyl alcohol. Finally, this method was used to characterize 17 hydrolyzates from lignocellulosic biomass simultaneously for cellulose, hemicellulose, lignin and pectin derived degradation products.

Biography

Nico Anders has been working in the field of analysis and renewables since 2009. He has obtained his PhD from the TU Braunschweig in the group of Prof. Dr. Vorlop in Technical Chemistry. Since 2013, he is working as a Junior Research Group Leader in the Aachener Verfahrenstechnik at the RWTH Aachen University. His research interests are analysis of lignocellulosic biomass, green analytical chemistry, conversion of lignocellulosic biomass and chromatographic separation.

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